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# Strategic Investment for Sustainability: A Bibliometric Exploration of Green Finance Research

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## ABSTRACT

Supporting global development towards a sustainable direction has led to many findings, particularly in finance, such as green finance. This emphasizes the critical role of research and policymaking in shaping investment strategies that support sustainability. This study conducts a bibliometric analysis to map the knowledge structure, research development, and current trends in green finance and sustainable investment strategies. A total of 471 articles published between 2015 and 2025 were collected from the Scopus database using specific keywords and filtered based on relevance to the topic. Data were analyzed using Biblioshiny and VOSviewer through descriptive analysis, co-word analysis, thematic evolution, thematic mapping, and co-citation analysis. The results show a significant increase in publications over the last decade, with "green finance", "sustainable finance", and "sustainable development" as dominant themes. In recent years, emerging topics such as fintech, ESG, and green innovation have gained more attention. The findings highlight China and the United States as leading contributors, with a growing interdisciplinary collaboration trend. This research provides a comprehensive overview of the thematic evolution of green finance and proposes future research directions relevant to scholars, policymakers, and practitioners.

**KEYWORDS:** Bibliometric Analysis; Green Finance; Strategic Financing; Sustainability Trends

## INTRODUCTION

Environmental degradation, global climate change, rising temperatures, and social inequality remain persistent and unresolved challenges. These issues have driven a paradigm shift in global development to sustainable development. The post-pandemic global economic recovery in several countries has further accelerated the emergence of the "green recovery" concept, which emphasizes the importance of environmentally friendly economic strategies (Liu & Wu, 2023). International and regional organizations, including the United Nations (UN), the World Bank, the International Monetary Fund (IMF) have progressively urged member states and trade partners to embed green finance principles through the adoption of sustainability-oriented policies (Zhang et al., 2021). Increasing the flow of finance toward climate action and sustainable development has become critical. According to the OECD (2017), global infrastructure investment needs are estimated to reach approximately USD 6.3 trillion annually between 2016 and 2030. This figure increases by 10% to USD 6.9 trillion annually when accounting for the additional investments required to meet the 2°C global temperature rise limitation target. Meanwhile, the actual annual investment remains below the estimated needs, ranging between USD 3.3 and 4.4 trillion per year, indicating a critical urgency and a significant challenge in addressing the global financing gap (OECD, 2020).

Green finance is an innovative approach within the financial system that encompasses a variety of instruments. According to Liu and Wu (2023), green financial instruments refer to financing mechanisms allocated to support environmentally conscious projects, such as renewable energy, waste management, and green infrastructure, in order to facilitate the transition toward a zero-carbon economy and to mitigate climate change. A study conducted by Li et al. (2023) In the context

of China, green finance policies are recognized as having a substantial influence in motivating companies to accelerate green technological innovation through mechanisms that alter production cost structures and operational risk management, thereby creating economic incentives for sustainable investment (Abdul Gafoor et al., 2024; Andreeva et al., 2018). Green finance reflects an investment approach that not only emphasizes environmental aspects but also integrates ESG factors into investment decisions. Through various financial instruments, Green finance facilitates the alignment of financial objectives and sustainability commitments. Furthermore, beyond its implications for investors, green finance also exerts market pressure on companies to adopt green technological innovations by adjusting their cost structures and managing operational risks accordingly.

Sustainable investment strategies are an integral component of the green finance concept, emphasizing The growing emphasis on the inclusion of ESG criteria in investment strategies allocation processes. This approach seeks to ensure that the pursuit of financial returns is aligned with commitments to social responsibility and environmental preservation (Judijanto et al., 2024). According to recent studies, the research trend in green finance has shown a significant upward trajectory, beginning in 2019 and accelerating sharply between 2021 and 2024 coinciding with the new normal and post-COVID-19 recovery period. Despite this substantial growth in academic interest, several critical gaps remain. These include the limited research focusing on the integration of green investment strategies into corporate decision-making, the lack of long-term impact assessments of green finance on corporate ESG performance, and the geographical concentration of green finance studies, which predominantly focus on developed countries such as China and those in Europe, with relatively little attention paid to developing nations.

Consequently, this study performs a systematic bibliometric review to mapping the intellectual landscape, international collaborations, and thematic developments in the field of green finance and sustainable investment strategies. By analyzing data from the Scopus database, This research provides a systematic overview of historical trends, emerging themes, and to formulate a future research agenda that is both practically relevant and contributes to the development of sustainable policy frameworks.

## METHODOLOGY

Bibliometric research, as originally introduced by Pritchard (1969) a statistical methods for analyzing scientific publications. The main focus of this approach is to understand publication patterns and the dissemination of scientific information in the digital information era, as it helps researchers to filter, map, and navigate the rapidly growing body of literature, particularly in strategic fields. According to Donthu et al. (2021), bibliometric research is a quantitative method aimed at mapping the intellectual structure of a scientific field, understanding its thematic evolution, and tracing the relationships among authors, journals, keywords, and research institutions. Bibliometric analysis has become highly valuable for researchers in defining future research directions and enhancing scholarly contributions.

This study employs the Scopus database due to its extensive coverage, high index quality, and the availability of comprehensive metadata necessary for bibliometric analysis. The initial step involved retrieving data from https://www.scopus.com. Subsequently, the authors conducted a systematic screening and selection process using the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). PRISMA is a structured reporting framework designed to filter, select, and assess the quality of studies in the context of systematic reviews. The final search query applied; (TITLE-ABS-KEY ("Green Finance") OR TITLE-ABS-KEY ("Green Financing") OR TITLE-ABS-KEY ("Sustainable Finance") OR TITLE-ABS-KEY ("Climate Finance") AND TITLE-ABS-KEY ("Sustainable Investment") OR TITLE-ABS-KEY ("Strategic Investment") OR TITLE-ABS-KEY ("Sustainable Development")) AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA, "ENVI") OR LIMIT-TO (SUBJAREA, "ECON") OR LIMIT-TO (SUBJAREA, "BUSI")) AND (LIMIT-TO(DOCTYPE, "ar")) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO(LANGUAGE, "English")) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (PUBSTAGE, "final")).

Table 1. PRISMA Protocol

| Stage | Description | Result |
|---|---|---|
| Identification (through initial search in Scopus database with relevant query) | Keywords: "Green Finance", "Green Financing", "Sustainable Finance", "Climate Finance", "Sustainable Investement", "Strategic Investment" and "Sustainable Development". | 2.317 articles |
| Screening (filtering documents by criteria) | Screening Criteria:<br>1. Year: 2015– 2025<br>2. Subject Area: a) Economic, Econometrics and Finance, b) Business, Management and Accounting, c) Environmental Science<br>3. Document Type: Artikel<br>4. Source: Jurnal<br>5. Language: Inggris<br>6. Publication Stage: Final | Screening Criteria:<br>1. Tahun: 2.293<br>2. Subject Area: 1.821<br>3. Document Type: 1.247<br>4. All open access: 471 |
| Eligibility and Final Inclusion | Assessed based on abstracts and keywords, only relevant articles were retained which resulted in a final document count for bibliometric analysis. | 467 articles |

Source: Data processed (2025)

The author limits the data search by setting the period from 2015-2025 with document types in the form of articles, English, and journal sources and the final publication stage. After the data in scopus has been determined, then the data is downloaded in CSV or RIS format to be analyzed using vos viewers and biblioshiny. VOSviewer is a program developed to create and view bibliometric maps of research trends (Van Eck & Waltman, 2010). The analysis processed using VOSviewer and Biblioshiny via R Studio. The analysis covers several aspects, including annual scientific article production, total literature output by various institutions, and international collaboration networks, with the objective of understanding the geographical and institutional distribution of research on green finance. This study investigates the thematic structure and intellectual development of green finance research and offers future research agenda.

# RESULTS AND DISCUSSION

**General analysis of the dataset**

The general description of the dataset is shown in Table 2. The general information obtained includes a total of 467 out of 471 eligible documents come from 172 sources with a timespan of 2015-2025. The average annual growth rate (production) is 43.93%. This indicates substantial growth in green finance and sustainable investment research. The high number from Keywords Plus (1,138) and Author's Keywords (1,392), reflects the complexity and breadth of themes in this field. The international collaboration rate reached 36.19%, indicating that this issue has received global attention and become a cross-national scientific collaboration. All documents are scientific articles, indicating the dominance of formal academic contributions that have undergone a peer-review process.

Table 2. General description of the dataset

| Description | Results |
|---|---|
| Main Information About Data | |
| Timespan | 2015:2025 |
| Sources (Journals, Books, etc) | 172 |

| | |
|---|---|
| Documents | 467 |
| Annual Growth Rate % | 43.93 |
| Document Average Age | 2.28 |
| Average citations per doc | 24.03 |
| References | 0 |
| Document Contents | |
| Keywords Plus (ID) | 1138 |
| Author's Keywords (DE) | 1392 |
| Authors | |
| Authors | 1395 |
| Authors of single-authored docs | 62 |
| Authors Collaboration | |
| Single-authored docs | 63 |
| Co-Authors per Doc | 3.21 |
| International co-authorships % | 36.19 |
| Document Types | |
| Article | 467 |

Source: Data processed (2025)

**Production of scientific articles and country and affiliate collaboration**

Figure 1 presents data on scientific article production every year regarding green finance research with keywords that have been determined on the Scopus database. From the search results, a total of 467 out of 471 documents from 2015-2025 (for 10 years) were found that were feasible and could be analyzed bibliometrically. The time span was determined on the basis of the author's reasoning because green finance is a fairly new topic and discussion. Green finance research has grown significantly over time from year to year because previously the number tended to be small and even found results in 2015 the number of article production was 0.

Figure 1. Scientific Article Production
Source: Data processed (2025)

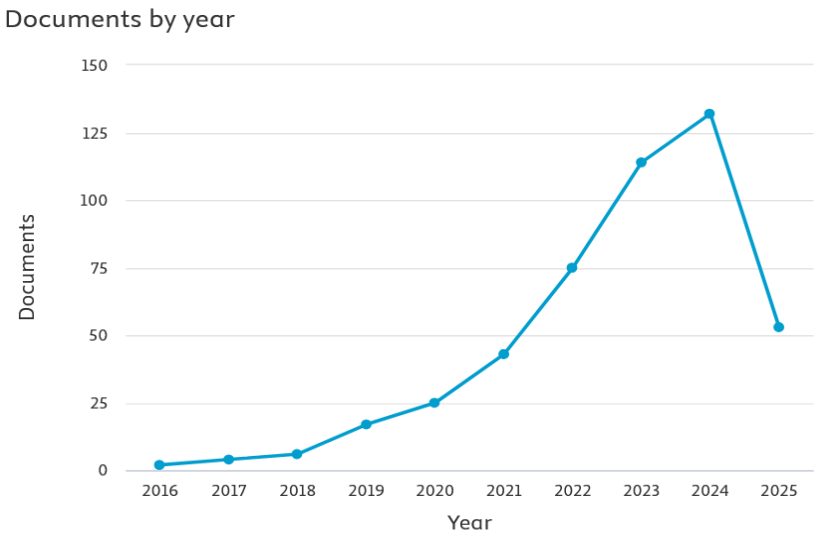



Figure 1 present that the trend of green finance research has increased sharply starting from 2020 until now (the last 5 years). In the first phase (2016-2020), the number of publications was still limited and showed slow growth. Entering the second phase (2021-2024), publications have increased, with the highest in 2024 recording more than 130 documents. This surge indicates a significant increase in academic awareness and urgency towards sustainability issues. However, the

graph shows a drop in the number of publications in 2025. This decrease most likely does not reflect a substantial decline in academic interest, but rather due to incomplete publication data for the current year. The growth of green finance research reflects rising global awareness of climate change and sustainability. These issues are increasingly becoming mainstream in public policy and academic discourses, along with the push for global initiatives such as the SDG's and increased attention to ESG factors in the financial system (UNCTAD, 2019).

Figure 2. Map of Research Countries Collaboration
Source: Data processed (2025)


Figure 2 shows the collaboration between countries. From the map, the most research collaborations on green finance topics are between China and Pakistan (21), China and United Kingdom (10), China and Saudi Arabia (7), Pakistan and Saudi Arabia (7), United Kingdom and USA (7), China and Korea (6), United Kingdom and France (6), United Kingdom and Germany (6), China and Malaysia (5) and finally Germany and Italy (5). From this information, it indicates that China dominates and holds an important key in research collaboration between countries. This is undeniable because the Chinese government has encouraged the application of green finance to support low-carbon economic growth. As evidenced by the issuance of guidelines on green finance for the first time in China in 2016 People's Bank of China (PBoC). This encourages systemic research and growth of green finance products (Zhang et al., 2025). In addition, China also has excellent campuses that have special study centers on green finance and ESG, and actively publish in Scopus journals such as Southwestern University.

Figure 3. Top 10 Affiliates by Document
Source: Source: Data processed (2025)

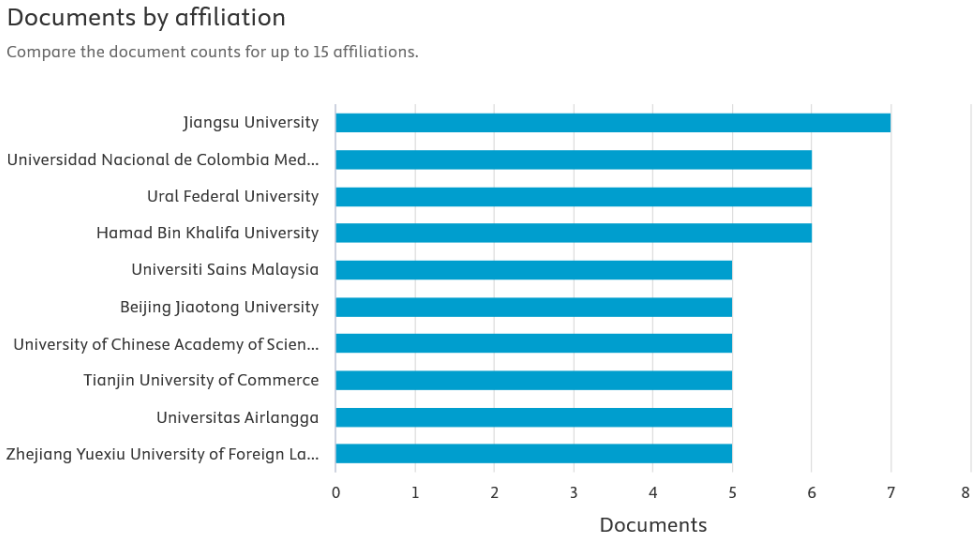



Figure 3 shows the top 10 affiliations that have significant contributions to green finance research in relation to strategic investment. Based on the Documents by affiliation results, Jiangsu University tops the list with 7 documents, followed by Universidad Nacional de Colombia Medellin, Ural Federal University, and Hamad Bin Khalifa University with 6 documents each. While several other institutions, including Airlangga University, were recorded to have 5 documents. The distribution of publications based on this affiliation is the majority of contributions from several universities in China. This indicates that some of these countries have a dominant role in the contribution of green finance research (as in Figure 2). However, it can be said that the difference in distribution is still relatively small. Overall, this distribution of documents reflects that green finance research in the realm of strategic investment for sustainability is a growing global concern. This highlights research potential and inter-institutional collaboration to support SDGs achievement.

**Leading Journals**

Table 2. Top 10 Relevant Journal

| No | Sources | Articles | Publisher |
|---|---|---|---|
| 1. | Sustainability (Switzerland) | 120 | MDPI |
| 2. | Frontiers In Environmental Science | 26 | Frontiers Media S.A |
| 3. | Environmental Science and Pollution Research | 11 | Springer |
| 4. | Sustainability (Switzerland) | 12 | MDPI |
| 5. | Humanities And Social Sciences Communications | 10 | Springer |
| 6. | Journal Of Environmental Management | 10 | Academic Press |
| 7. | International Journal of Energy Economics and Policy | 9 | Econjournals |
| 8. | Business Strategy and The Environment | 8 | John Wiley and Sons Ltd |
| 9. | Energy Economics | 8 | Elsevier |
| 10. | Cogent Economics and Finance | 7 | Cogent OA |

Source: Data processed (2025)

Table 3 presents the top 10 most relevant journals during the period 2015-2025 related to green finance research in relation to strategic investment. Table 3 indicates that Sustainability from Switzerland (120) is the top list, followed by Frontiers In Environmental Science (26), Environmental Science and Pollution Research (11), Humanities And Social Sciences Communications (10), Journal Of Environmental Management (10), International Journal of Energy Economics and Policy (9), Business Strategy and The Environment (8), Energy Economics (8), and in 10th place is Cogent Economics and Finance (7). The results of the bibliometric analysis show that the most relevant

leading journals on the topic of green finance and strategic investment are dominated by journals in economics and management. This reflects that sustainability issues have become an integral part of modern economic studies, especially in strategic decision-making, sustainable financing, and ESG-based corporate governance. This dominance also shows that the approach to green finance is still strongly supported by the theoretical and methodological frameworks in economics and management, even though the application context is cross-disciplinary.

**The most cited articles**

Table 4. Top 10 Most Cited Articles

| No | Article | TC |
|---|---|---|
| 1 | Sustainable development, ESG performance and company market value: Mediating effect of financial performance (Zhou et al., 2022) | 443 |
| 2 | A sustainable development pathway for climate action within the UN 2030 Agenda (Soergel et al., 2021) | 312 |
| 3 | Sustainable business model archetypes for the banking industry (Yip & Bocken, 2018) | 266 |
| 4 | Examining the interconnectedness of green finance: an analysis of dynamic spillover effects among green bonds, renewable energy, and carbon markets (Y. Zhang & Umair, 2023) | 253 |
| 5 | Does green financing help to improve environmental & social responsibility? Designing SDG framework through advanced quantile modelling (Sinha et al., 2021) | 252 |
| 6 | Closing the green finance gap – A systems perspective (Hafner et al., 2020) | 232 |
| 7 | Does green finance really deliver what is expected? An empirical perspective (Khan et al., 2022) | 228 |
| 8 | Bridging funding gaps for climate and sustainable development: Pitfalls, progress and potential of private finance (Clark et al., 2018) | 203 |
| 9 | Can green finance development reduce carbon emissions? Empirical evidence from 30 Chinese provinces (Chen & Chen, 2021) | 192 |
| 10 | The Impact of Financial Development and FDI on Renewable Energy in the UAE: A Path towards Sustainable Development (Samour et al., 2022) | 168 |

Source: Data processed (2025)

**The most contributing authors**

Table 5. Top 10 most contributed authors

| No | Authors | Articles | Articles Fractionalized |
|---|---|---|---|
| 1. | Esquivias Miguel Angel | 4 | 0.74 |
| 2. | González-Ruiz Juan David | 4 | 1.25 |
| 3. | Marín-Rodríguez Nini Johana | 4 | 1.33 |
| 4. | Taghizadeh-Hesary Farhad | 4 | 1.08 |
| 5. | Ari Ibrahim | 3 | 1.50 |
| 6. | Chen Xihui Haviour | 3 | 0.75 |
| 7. | Habib Ashfaq | 3 | 0.83 |
| 8. | Khan Muhammad Asif | 3 | 0.83 |
| 9. | Koc Muammer | 3 | 1.50 |
| 10. | Lyulyov Oleksii | 3 | 0.92 |

Source: Data processed (2025)

Table 5 shows the authors who have contributed the most to research on the themes of green finance and strategic investment for sustainability, based on two indicators: the number of articles published

and fractionalized authorship (contribution weighting based on the number of authors per article). Authors such as Esquivias Miguel Angel, González-Ruiz Juan David, and Marín-Rodríguez Nini Johana have the highest number of articles, with four publications each. This indicates their consistent involvement in building literature on the theme of green finance. Meanwhile, in terms of fractionalized articles, Ari Ibrahim and Koc Muammer recorded the highest score (1.50), indicating that they are more often the main contributors in the articles they write, rather than just minor collaborators. Fractionalized authorship is an important method to give fair weight to each author's contribution (Perianes-Rodriguez et al., 2016). The high score of fractionalized articles from multiple authors indicates a deeper involvement in the writing process and research design.

## Thematic Analysis

Bibliometric analysis focuses primarily on mapping scholarly research in the field under study, assessing recent research developments, and identifying the direction of potential themes in the future. For this purpose, four analytical approaches are used: thematic map, thematic evolution, co-word analysis, and co-citation network. In thematic analysis, this research uses author keywords as the basic unit for topic exploration and mapping.

### Thematic map

The bibliometric research using biblioshiny resulted in the thematic map analysis shown in Figure 4. The word tree map shown visualizes the frequency of occurrence based on author keywords. It was found that “sustainable development” (231 occurrences, 12%) and “green finance” (165 occurrences, 9%) were the two most dominant themes in the word map. This indicates the primary research focus over the past decade. This aligns with global agendas, such as the SDGs and the Green New Deal, which highlight the role of sustainable finance (OECD, 2020).

The word “China” (94 occurrences, 5%) in the word tree map (Figure 4) is also among the most frequently occurring keywords, indicating that the country is one of the locations that dominate empirical studies on the topic. This supports Taghizadeh-Hesary and Yoshino’s (2020) finding that China plays a key role in advancing green finance through green bond issuance and the development of a green taxonomy framework. The emergence of new keywords also reflects the evolving scope of research such as “ESG” (Environmental, Social, Governance) with 29 occurrences (2%), ‘Innovation’ with 60 occurrences (3%), “Carbon Emission” with 30 occurrences (2%) indicates that research is shifting from conceptual topics to implementative issues, such as how financial innovation and ESG practices can mitigate carbon emissions.

Figure 4. Word Tree Map
Source: Data processed (2025)

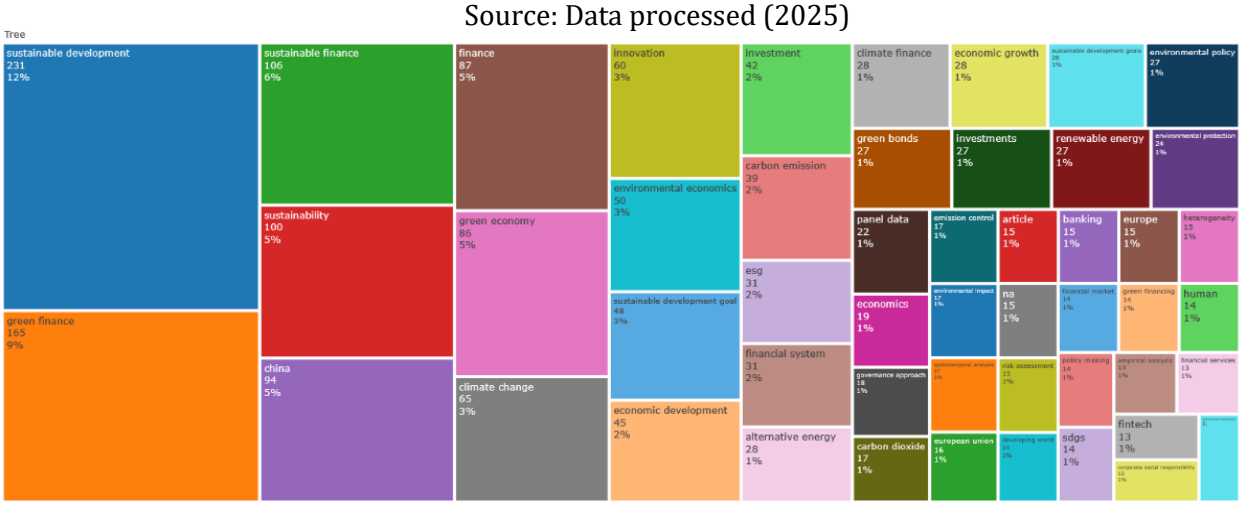
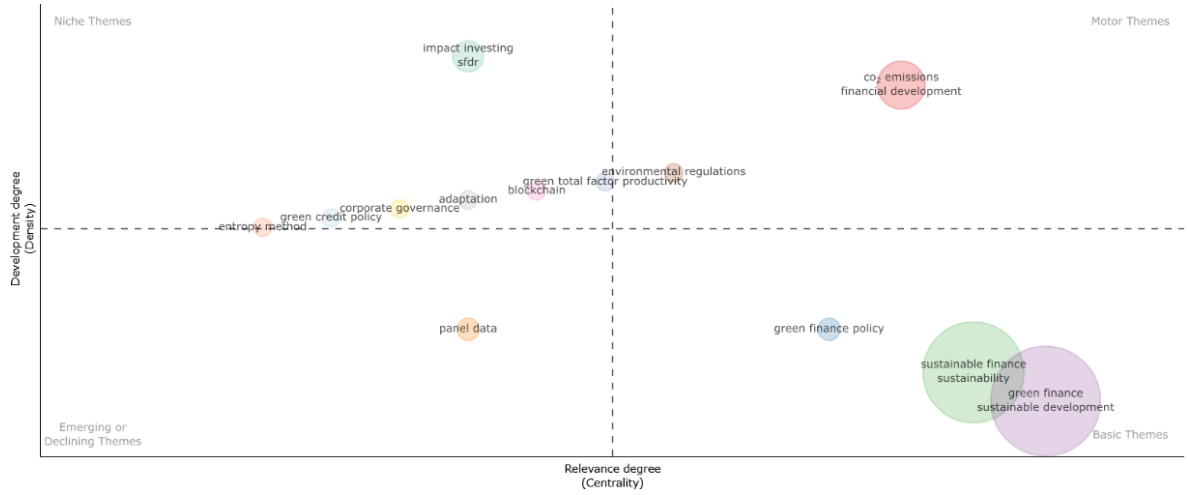


Figure 5 presents a thematic map illustrating the relative positions of green finance and strategic investment themes based on two key dimensions: centrality (relevance degree) and density (development degree). Themes such as $CO_2$ emissions and financial development are in the upper right quadrant. These are characterized by high relevance and strong development degree, indicating that they are at the core of current research and are widely associated with other themes. Themes such as green finance, sustainable development, sustainability, and sustainable finance emerge as basic themes with high centrality but low density. Themes such as impact investing and SFDR (Sustainable Finance Disclosure Regulation) fall in the upper left quadrant, which shows high development but less connection with other themes. This theme may reflect a particular specialization or emerge from new regulations and practices, such as the EU's sustainability disclosure policy. Meanwhile, the fourth quadrant shows themes such as panel data, entropy method, and green credit policy in the lower left quadrant, indicating that these themes are in their early stages or beginning to decline.

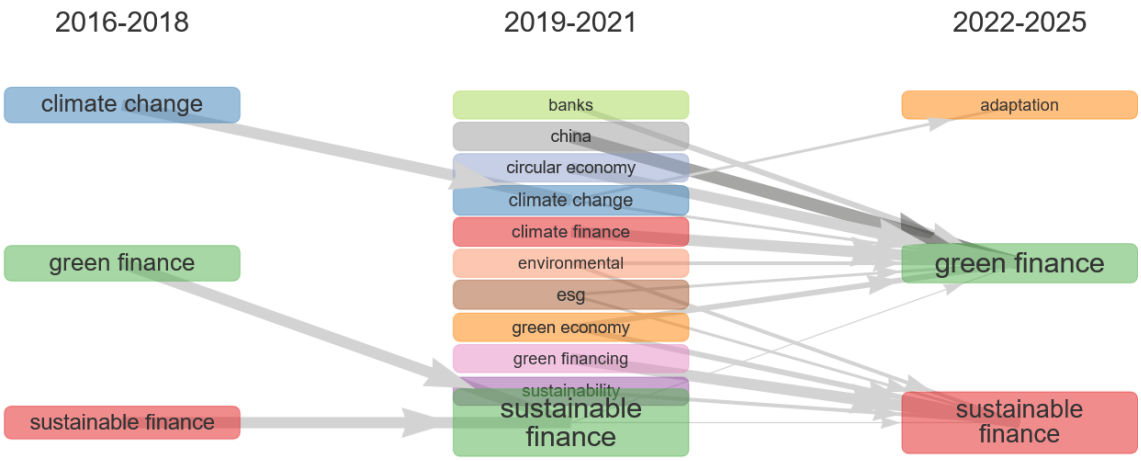
Figure 5. Thematic Map
Source: Data processed (2025)




## Thematic evolution

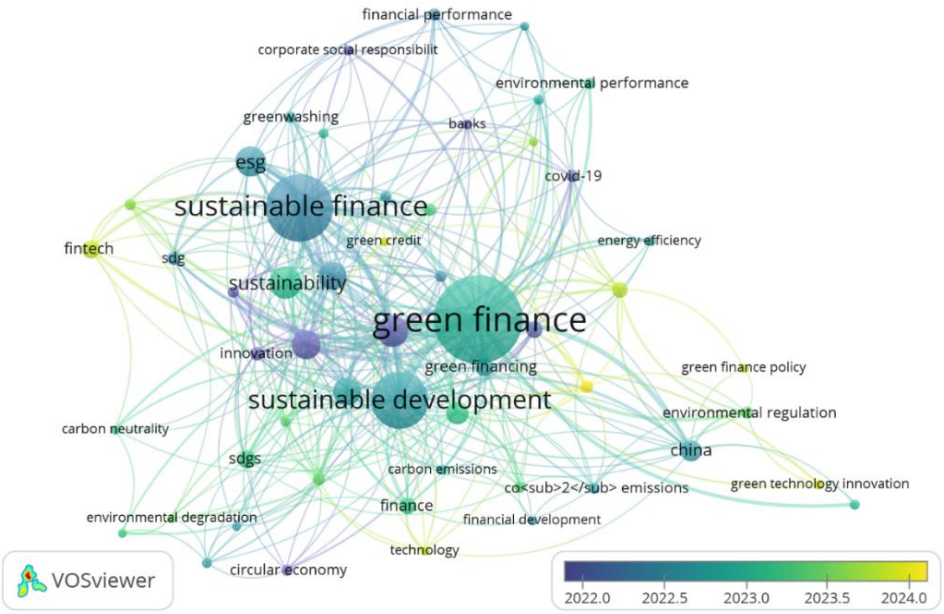
The thematic evolution analysis of biblioshiny in Figure 6 provides an overview of the dynamics and development of research topics over the past decade. The evolution map is generated from author keywords with 2 cutting points, namely 2018 and 2021. This was conducted to analyze the thematic evolution of green finance research in the pre-COVID-19, during COVID-19, and post-COVID-19 eras. The results of the thematic evolution analysis show that research in the field of green finance has undergone significant development, from basic concepts to an interdisciplinary approach that integrates ESG, circular economy, and green financial instruments. Phase I (2015–2016) marks the initial stage of green finance development, driven by global commitments such as the 2015 Paris Agreement, which promoted the integration of sustainability into the financial system (OECD, 2020). In Phase II (2018–2021), the scope of research expanded to include diverse approaches, as reflected by the emergence of new themes. The term “ESG” represents the increasing integration of ethical values into financial research and practice. Phase III (2022–2025) indicates continued academic focus on “green finance” and “sustainable finance.” The appearance of less-connected themes such as “adaptation” suggests the development of emerging subthemes still under exploration by the scholarly community.

Thematic Evolution Map
Source: Data processed (2025)




The authors also analyzed thematic evolution using VOSviewer. Figure 7 presents a co-word overlay visualization based on author keywords, with a minimum occurrence of five. From 1,385 keywords, 54 met the threshold. Circular bubbles represent keyword frequency, while line thickness and color reflect the strength of relationships and the dominant year (ranging from dark blue to yellow). Green finance, sustainable finance, and sustainable development are central themes, while ESG, sustainability, green credit, and environmental regulation emerge as key related topics. Keywords such as fintech, green finance policy, and green technology innovation appear in yellow, indicating increased research interest after 2023.

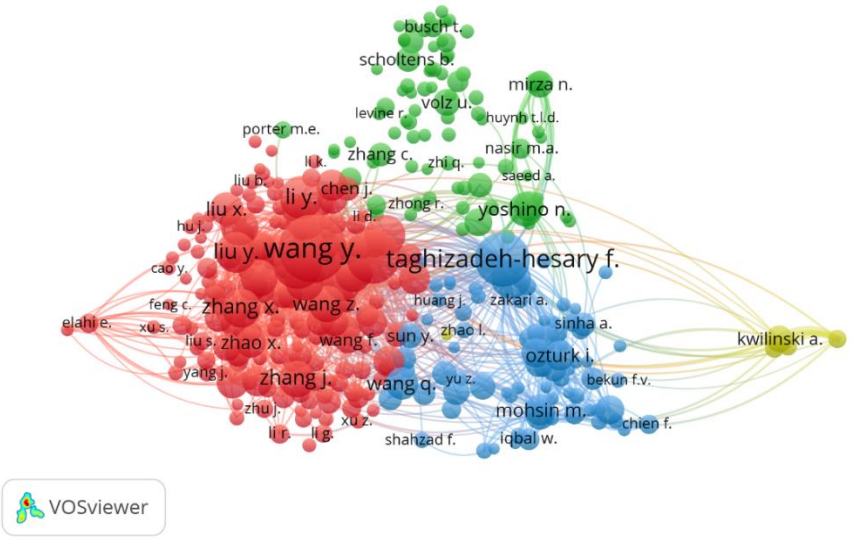
Figure 7. Co-word analysis (overlay visualization)
Source: Data processed (2025)



### Co-citation analysis

Lastly, Figure 7 presents a co-citation analysis using VOSviewer, mapping the intellectual landscape of green and sustainable finance based on frequently co-cited authors. It can be concluded from figure 7 that this co-citation visualization shows that green finance research is expanding globally but clustered geographically and methodologically. Three main intellectual centers are established: China (empirical-quantitative), Asia & developing countries (policy & energy), and Europe (conceptual & normative). Relationships between clusters strengthen knowledge ecosystems across contexts, while figures such as Taghizadeh-Hesary become multidisciplinary reference centers.

Figure 8. Co-citation Networking
Source: Data processed (2025)




## CONCLUSION

Bibliometric analysis reveals significant growth in green finance and sustainable investment research over the past decade. While green finance, sustainable finance, and sustainable development remain central to academic discourse, the field has also diversified toward emerging topics aligned with technological advances and environmental policy. Thematic visualization through thematic map, thematic evolution, co-word analysis, and co-citation network collectively provide an in-depth understanding of the intellectual landscape of this field. The findings not only show the dynamics of knowledge development, but also open up new exploration spaces that are practically and theoretically relevant. Therefore, this study makes a strategic contribution in mapping future research directions and supporting the strengthening of policy and investment agendas that are more responsive to the challenges of sustainable development.

## Acknowlegments

Bibliometric findings indicate future research opportunities in green finance and strategic investment for sustainability. First, the results of thematic evolution show a shift from classic themes to new topics such as adaptation, fintech, and green innovation emerging in the 2022-2025 timeframe. This suggests the need for interdisciplinary research linking digital technology with green finance, for example in the form of developing blockchain-based green financing instruments or artificial intelligence in the process of evaluating sustainable investment risks.

Second, the connection between green finance and topics such as ESG, greenwashing, and corporate social responsibility in the co-word network analysis shows the importance of a strong governance approach in promoting green investment credibility. Future research could explore the extent to which authentic ESG practices enhance investment attractiveness, as well as how greenwashing affects investor decisions and corporate reputation. Fourth, from the co-citation network analysis, we found the dominance of research clusters from China and East Asia, and scientific collaboration

is still regionally focused. Research opportunities are wide open to develop comparative studies between countries, especially in the Southeast Asian region, to understand the dynamics and challenges in implementing green finance in different economic systems. Lastly, the emergence of new themes such as impact investing, SDR, and green total factor productivity opens up new horizons in productivity and impact evaluation approaches of sustainable investment. Future research may contribute to developing a comprehensive framework for evaluating green investment performance, encompassing financial, social, and environmental dimensions.

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